

How Safe Is Hydrogen Fuel?

Hydrogen safety facts:

- ▶ Hydrogen is the most abundant and lightest element in the universe
- ▶ Due to its light weight, released hydrogen dissipates quickly from its source
- ▶ Hydrogen is non-toxic
- ▶ Hydrogen is less flammable than gasoline and natural gas due to its higher ignition temperature.ⁱ
- ▶ The combustion of hydrogen produces zero harmful pollutants, emitting only pure, potable water and heat that can be recaptured for other uses
- ▶ Hydrogen has been produced and used safely for decades across a wide variety of applications in industry, manufacturing, and aerospace.

What are the properties of hydrogen?

Hydrogen is the simplest and most common element in the universe. It is a colorless, odorless, and tasteless gas that has the highest energy content per unit of weight of any known fuel. Hydrogen is very chemically active and rarely stands alone as an element. It usually exists in combination with other elements, such as oxygen in water and carbon in methane. Hydrogen therefore must be broken from its bonds with other elements in order to be used as a fuel.

How does hydrogen compare to gasoline?

Hydrogen is non-toxic, and if released into the air it not poisonous and will dissipate quickly into the atmosphere. By comparison, all petroleum fuels are asphyxiants, and are poisonous to humans.

Pure hydrogen gas is indeed flammable, and as with all fuels, hydrogen needs to be handled with caution. However, compared to gasoline, hydrogen burns cleanly and when ignited it will burn quickly up and away from its base. Being the lightest element (fourteen times lighter than air), hydrogen rises and spreads out quickly in the atmosphere, becoming so sparse that it cannot burn. By contrast, vapors from fuels such as gasoline and diesel, as well as natural gas are heavier than air, and will not disperse, remaining a flammable threat for much longer.

Because hydrogen flames are invisible and hydrogen itself has no odor, hydrogen sensors must be employed to detect leaks in cars, stations and anywhere hydrogen is used or stored.

What about the Hindenburg?

Many of the public's perceived notions of hydrogen being a dangerous fuel stem from the famous explosion of the Hindenburg. NASA determined that the explosion of the Hindenburg zeppelin was due to the ignition of the highly flammable iron oxide and aluminum skin that coated the dirigible, and was not due to the hydrogen. In fact, none of the 35 fatalities were related to the hydrogen fuel (33 died from jumping from the airship, 2 from burns related to the flammable fabric and diesel fuelⁱⁱ).

Is storing hydrogen safe?

Because hydrogen is a gas, it needs to be pressurized in on-board storage tanks in order to achieve acceptable driving ranges. Super-durable, high pressure tanks made of ultra-lightweight, advanced carbon composite material have been designed to meet all applicable regulatory and safety standards. Tanks holding pressures up 10,000 psi have been tested and approved for automotive use. (For more on hydrogen storage, see Hydrogen Storage Fact Sheet)



The car on the left is hydrogen-fueled, the car on the right is gasoline-fueled. Both pictures were taken 1 minute after flame ignition. The hydrogen flame diminished shortly thereafter, and the interior of the car was left undamaged. The gasoline car continued to burn. http://www.bellona.no/en/energy/hydrogen/report_6-2002/22966.html

ⁱ For more photos and the complete study, see

http://www.bellona.no/en/energy/hydrogen/report_6-2002/22966.html

ⁱⁱ <http://www.hydrogennow.org/Facts/FAQs.htm>